

**WORLDWIDE EMERGING ENVIRONMENTAL ISSUES AFFECTING THE U.S. MILITARY**  
Subcontract No: 1048, LMI Task No: MAN0B.04, for the U.S. Army Environmental Policy Institute

**JANUARY 2011 REPORT**

Note to Readers: Pages 1-13 comprise the summary and analysis of this report. Expanded details for some items are in the Appendix beginning on page 14. Many new items this month are related to or are updates to previously identified items; hence, there is a large section for previously identified items.

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**Item 1. An Emerging Nordic-Baltic Alliance Might Have Security Implications**

The first Nordic-Baltic Summit was held in London, January 19-20, 2011 to establish a regional “alliance” for addressing issues of common interest. The Summit was attended by the leaders of Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, Sweden, and the host, the UK Prime Minister, David Cameron. Reportedly, one of the outcomes is building an energy “supergrid” to link suppliers of renewable energy. A follow-up summit is planned for Sweden in 2012. Although the Summit’s focus was on economic and social issues, speculations are that the alliance will be expanded to security issues. In the meantime, Nordic foreign ministers will hold an April meeting in Helsinki to discuss prospects for a “NATO-type” defense pact to address Arctic-related security issues. Since there are conflicting national jurisdictions over the Arctic, and global warming is expected to open shipping and access to large gas and oil resources, new agreements seem necessary to prevent future conflicts.

**Military Implications:**

Such new alliances could lead to new security arrangements and environment-related regulations; the military should begin to explore how to react and how the Army Strategy for the Environment could be applied. [See Arctic-related items in previous environmental security reports.]

**Sources:**

UK: Northern summit was not anti-European

<http://euobserver.com/19/31677>

Nordic Baltic Summit

<http://uknordicbaltic.readandcomment.com/>

Arctic NATO to watch the Russians

[http://english.pravda.ru/world/europe/20-01-2011/116584-arctic\\_nato-0/](http://english.pravda.ru/world/europe/20-01-2011/116584-arctic_nato-0/)

UK-Nordic-Baltic Summit to form new "alliance"

<http://www.baltictimes.com/news/articles/27816/>

**Item 2. International Air Cargo Screening Cooperation Requested**

The executive director of the Airforwarders Association cargo industry group asked the U.S. Transportation Security Administration to bring shipping countries together to share screening methods for inbound international packages on passenger planes to meet deadlines. The lack of international standardized procedures impedes the implementation of a global system.

**Military Implications:**

Where possible, relevant military entities should share multi-purpose sensors and related screening technology with negotiators to improve forthcoming international standards for air cargo screening.

**Source:**

TSA Wants Countries to Cooperate on Air Cargo Screening: Industry Official

[http://gsn.nti.org/gsn/nw\\_20110124\\_5589.php](http://gsn.nti.org/gsn/nw_20110124_5589.php)

### Item 3. Fuel efficiency standards are changing around the world

UNEP in cooperation with other agencies has developed guidelines on sustainable procurement of vehicles for the UN. Recent reports by international organizations are pointing to the need for globally harmonized standards for assessing the efficiency of different fuels and relevant new technologies. The UN Industrial Development Organization (UNIDO) report *Motor Systems Efficiency Supply Curves* notes the lack of a transparent methodology for quantifying the energy efficiency of motor systems and insufficient data for documenting present and future cost effectiveness potentials. The International Energy Agency's *50by50 Prospects and Progress* report calls for global fuel economy reduction to about 8L/100km with emissions halved in new automobiles by 2030 and in all automobiles by 2050 (by the Global Fuel Economy Initiative). A European expert group states that alternative fuels could replace fossil fuels by 2050. A RAND Corporation study *Alternative Fuels for Military Applications* concludes that the military should direct its efforts more towards increasing energy efficiency rather than investing in alternative fuels.

#### **Military Implications:**

It is fair to speculate that the UN procurement guidelines might be expanded to peacekeeping operations and therefore affect the military and its contractors. At the same time, fuel efficiency standards are increasing around the world, which increases the likelihood of global standards with assessment methodologies eventually affecting the military. The opportunity for military-to-military programs in fuel efficiency should be explored.

#### **Sources:**

Buying Better Vehicles for the UN

<http://www.greeningtheblue.org/news/buying-better-vehicles-un>

New report gives green light to the feasibility of halving carbon emissions from new cars by 2030

[http://www.iea.org/index\\_info.asp?id=1775](http://www.iea.org/index_info.asp?id=1775)

Clean Transport Systems

[http://ec.europa.eu/transport/urban/vehicles/road/clean\\_transport\\_systems\\_en.htm](http://ec.europa.eu/transport/urban/vehicles/road/clean_transport_systems_en.htm)

RAND study concludes use of alternative fuels by US military would convey no direct military benefit; recommends energy efficiency instead

<http://www.greencarcongress.com/2011/01/rand-20110125.html>

### Item 4. Prosecution of Pillage of Natural Resources as War Crime

At a conference held in The Hague, under the auspices of the Open Society Institute's Justice Initiative in coordination with the Dutch and Canadian governments, lawyers and human rights activists suggested legal instruments for prosecuting pillage of natural resources as a war crime. While this would primarily apply to companies profiting from the trade of "conflict minerals" and to cases that use resulting revenue to fund armed conflict, concerns also include environmental degradation and social aspects. The most notorious situation is the Democratic Republic of the Congo. Other countries on the "watch list" include: Brazil, China, India, Mexico, and Turkey. In a related development, the U.S. Dodd-Frank Act (H.R. 4173) becomes effective on April 11, 2011. It includes a clause requiring companies to report on the use of certain minerals from the Democratic Republic of the Congo and neighboring countries. Non-compliance will be fined. [Related item: *Natural Resources Fuel Violence in Eastern D.R. Congo* in September 2010 environmental security report.]

**Military Implications:**

Since “conflict minerals” pillage is more likely to occur in vulnerable or conflict areas, the military might be called upon to help enforce the relevant regulations locally, as well as to report and stop breaches. Additional training requirements should be explored for personnel likely to be deployed in such areas.

**Sources:**

Firms Linked to Conflict Minerals May Face Prosecution

<http://www.ens-newswire.com/ens/jan2011/2011-01-03-02.html>

‘Conflict Mineral’ Strategy Emerging

[http://wardsauto.com/ar/conflict\\_mineral\\_strategy\\_101228/](http://wardsauto.com/ar/conflict_mineral_strategy_101228/)

Digging In: Recent Developments on Conflict Minerals

<http://www.enoughproject.org/publications/digging-in-conflict-minerals>

Conflict minerals law could push prices higher - MSCI ESG

<http://www.miningweekly.com/article/conflict-minerals-law-could-push-prices-higher--mcsi-esg-2011-01-21>

**Item 5. Technological Advances with Environmental Security Implications****5.1 Flexible Supercapacitor Could Power Wearable Environmental Sensors**

Prof. Zhong Lin Wang of the Georgia Inst. of Technology and Jong Min Kim of South Korea’s Samsung Electronics claim development of a prototype flexible supercapacitor that can be incorporated into textiles. The devices use zinc oxide nanowires as electrodes. Combined with their previously developed flexible fiber nanogenerators, these units could power wearable environmental sensors.

**Military Implications:**

This development should be explored to reduce weight on the soldier and improve mobile environmental sensor capabilities.

**Source:**

T-Shirt replaces battery: Fiber-based electrochemical micro-supercapacitor

<http://www.physorg.com/news/2011-01-t-shirt-battery-fiber-based-electrochemical-micro-supercapacitor.html>

**5.2 Nanoimprint May Create Synthetic, Chemical-Free, Anti-Bacterial Surfaces**

Singapore’s A\*STAR Industrial Consortium On Nanoimprint and collaborating organizations are working on a project to create synthetic, chemical-free, anti-bacterial surfaces that can protect external structures from harboring pathogenic organisms. The nanoimprint technology creates complex nanometer-sized patterns on surfaces to mimic the texture of natural contaminant-repelling materials.

**Military Implications:**

This technology should be followed, as it may provide a means for reducing the environmental impact of naturally or deliberately introduced contaminants.

**Sources:**

Singapore consortium learns from nature to produce new chemical-free, anti-bacteria plastic 'skins'

<http://www.nanowerk.com/news/newsid=19556.php>

I.C.O.N. Project #2 : Towards Anti-Bacterial Surfaces

<http://www.imre.a-star.edu.sg/nil/project2.pdf>

### **5.3 Potential Bioweapon Countermeasure against Ebola and Marburg Virus**

Scientists of the University of Illinois at Chicago have identified a family of small molecules that apparently inhibit the Ebola and Marburg virus entry into human cells. Although not a cure, the breakthrough could represent a potential bioweapon countermeasure against use of those agents.

#### **Military Implications:**

If not already underway, relevant military personnel should contact the scientists to expedite this research for its potential in bio-war countermeasures.

#### **Source:**

Small Molecules May Prevent Ebola Infection

<http://tiger.uic.edu/htbin/cgiwrap/bin/newsbureau/cgi-bin/index.cgi?from=Releases&to=Release&id=3111&start=1287856211&end=1295632211&topic=0&dept=0>

### **5.4 Charged Particle Generators Produce Desert “Rainstorms”**

Scientists from the Swiss company Metro Systems International, working in the United Arab Emirates, have been trying to produce rainfall in the desert. Their system uses electronic ion generators to produce charged dust particles, which rise in the atmosphere and attract moisture that then falls as rain. Their claim of having created at least 52 specific “rain storm events” with this system has been met with some skepticism, although most of the storms were in July and August, when usually there is no rain at all.

#### **Military Implications:**

Global warming models predict that those areas with low rainfall will get less rain in the future. This could increase environmental migration, which can lead to conflicts in the receiving areas. This technology should be explored for its future potential to reduce such potential conflicts.

#### **Source:**

Technology created 50 rainstorms in Abu Dhabi's Al Ain region last year

<http://www.dailymail.co.uk/sciencetech/article-1343470/Have-scientists-discovered-create-down-pours-desert.html>

### **5.5 New Detection and Cleanup Techniques**

#### **5.5.1 Spectrometer Provides Accurate Beta/Gamma Detection in 15 Minutes**

Profs. David Hamby and Abi Farsoni of Oregon State Univ. have announced development of a new type of radiation spectrometer that can take as little as 15 minutes to determine the type and amount of beta- and gamma-emitting radionuclides present in materials such as soil. The development will be commercialized by Avicenna Instruments, of Corvallis, Oregon.

#### **Military Implications:**

These detectors should be reviewed for their utility in cleaning up radiation-contaminated environmental sites.

**Source:**

New technology to speed cleanup of nuclear contaminated sites

<http://www.physorg.com/news/2010-12-technology-cleanup-nuclear-contaminated-sites.html>

**5.5.2 Molecular Imprinted Polymers Provide Basis for Sensors of Multiple Compounds**

Prof. Rigoberto Advincula and colleagues of the Depts. of Chemistry, and Chemical and Biomolecular Engineering at the Univ. of Houston, are developing a family of sensors based on molecular imprinted polymers, which can be tailored to show an affinity for certain chemicals. These materials, prepared by electropolymerization directly on a gold surface, can form the basis for sensitive detectors for hazardous compounds in the environment.

**Military Implications:**

This research should be followed for its potential use in stationary and portable detection devices.

**Sources:**

Sensors to detect explosives, monitor food

<http://www.nanowerk.com/news/newsid=19807.php>

Electropolymerized Molecularly Imprinted Polymer Films of a Bis-Terthiophene Dendron: Folic Acid Quartz Crystal Microbalance Sensing

<http://pubs.acs.org/doi/abs/10.1021/am100805y>

**5.5.3 Water Testing and Cleaning Techniques**

Scientists at the Univ. of Central Florida, led by Prof. J. Manuel Perez, have developed a fast, sensitive, and probably less expensive test for cholera toxin in water. The test uses the sugar dextran coated with iron oxide nanoparticles, with a positive result detected by magnetic relaxation measurements.

ABSMaterials, Inc. of Wooster, OH is offering water purification systems based on the properties of a new swellable nano-structured glass, Osorb<sup>®</sup>, developed at the College of Wooster. In a demonstration, the material expands to eight times its original volume in the presence of hydrocarbons, purifying a gasoline-tainted sample of drinking water for consumption.

**Military Implications:**

These developments should be evaluated for their usefulness in areas with contaminated water and for managing hydrocarbon spills.

**Sources:**

Special Sugar, Nanoparticles Combine to Detect Cholera Toxin

<http://news.ucf.edu/UCFnews/index?page=article&id=00240041052a2b5bb012d4490764900622f>

Identification of Molecular-Mimicry-Based Ligands for Cholera Diagnostics using Magnetic Relaxation

<http://pubs.acs.org/doi/abs/10.1021/bc100442q>

NSF Webcast: Water and Oil Everywhere, and Now it's Safe to Drink

[http://www.nsf.gov/news/news\\_summ.jsp?cntn\\_id=118400&WT.mc\\_id=USNSF\\_51&WT.mc\\_ev=click](http://www.nsf.gov/news/news_summ.jsp?cntn_id=118400&WT.mc_id=USNSF_51&WT.mc_ev=click)



## **5.6 Environment-friendly Cement Processes**

### **5.6.1 New Cement Process Greatly Reduces Energy Load and CO<sub>2</sub> Emission**

A project led by chemist Peter Stemmermann at Germany's Karlsruhe Institute of Technology reports a new variety of cement called Celitement. It requires less energy to manufacture and emits less CO<sub>2</sub> in the production process. Cement manufacturing is responsible for about 5% of global CO<sub>2</sub> emissions.

#### **Military Implications**

This process should reduce military construction's CO<sub>2</sub> emissions footprint and energy usage, but Celitement is not yet economically competitive with traditional manufacturing methods. DARPA or related research systems might explore cost reduction procedures.

#### **Sources:**

New Chemistry, Less Energy Could Yield Greener Cement

<http://news.nationalgeographic.com/news/energy/2010/12/101209-green-cement-energy-greenhouse-gas/>

Celitement GmbH

<http://www.celitement.com/en/>

### **5.6.2 Sustainable Method to Recycle Rubble into Durable Construction Material**

Researchers at Georgia Tech describe a technique to recycle such building debris as that from the Haiti earthquake into a strong concrete material using sands and other natural materials widely available locally. While concerns remain about the variable quality of the concrete rubble and local materials, and the need to conduct further research on recycled concrete in general, lab tests show the new building substance "meets or exceeds the minimum strength standards defined by the American Concrete Institute and used in the U.S."

#### **Military Implications:**

Military personnel working in post-disaster environments with rubble debris crises should contact the researchers to find out how they can participate in researching and launching this recycling method in disaster locations.

#### **Sources:**

Researchers Find Method for Recycling Rubble, Rebuilding Haiti

<http://www.gatech.edu/newsroom/release.html?nid=63746>

The American Ceramic Society Jan-Feb 2011 Bulletin

<http://ceramics.org/publications-and-resources/the-bulletin/>

Breaking Haiti's the reconstruction logjam: Progress through rubble reuse

[http://americanceramicsociety.org/bulletin/2011\\_pdf\\_files/jan\\_feb\\_11/#/22/](http://americanceramicsociety.org/bulletin/2011_pdf_files/jan_feb_11/#/22/)

## **Item 6. Updates on Previously Identified Issues**

### **6.1 UN Review of Sustainable Development in Preparation for Rio+20 in 2012**

The First Intersessional Meeting for the UN Conference on Sustainable Development in preparation for the Rio+20 to be held in 2012 took place January 10-11, 2011. The advanced unedited version of the Synthesis Report presented to the delegates is a comprehensive assessment on the implementation of Agenda 21 and the Barbados Programme of Action, based on feedback from member states and UN agencies. It identifies, "Low political priority for



integrated decision making...” (para. 44) as nations’ most important challenge, while, “Unclear mandates, low accountability, competition for funds, conflicting interests, the absence of institutional mechanisms for joint work and collaboration all exacerbate these [implementation] problems, which are also reflected in the UN system.” (para. 50) [Related item: *UN Reform Report Stresses Environmental Issues* in March 2005 environmental security report.]

**Military Implications:**

The Rio+20 conference could speed up some reforms of the UN system and raise environmental concerns on the international and national agendas, thus strengthening enforcement of environmental regulations. Military personnel involved in promoting the Army Strategy for the Environment should study the review of the implementations of Agenda 21 and the Barbados Programme of Action to identify potential applications for the Army Strategy for the Environment.

**Sources:**

The United Nations General Assembly advanced unedited copy of the Synthesis Report

<http://www.earthsummit2012.org/index.php/news/313-synthesis-report-231210>

First Intersessional Meeting for the UN Conference on Sustainable Development

[http://www.uncsd2012.org/index.php?option=com\\_content&view=category&id=73&Itemid=124](http://www.uncsd2012.org/index.php?option=com_content&view=category&id=73&Itemid=124)

**6.2 More Aggressive Action Needed to Curb Ozone Depletions**

In *The Scientific Assessment of Ozone Depletion 2010* by UN, EU, and US organizations present a comprehensive analysis of the effect of stratospheric ozone changes on the Earth’s surface climate and of the effects of climate change on stratospheric ozone. It also includes several scenarios, finding that leakage from ozone-depleting substance (ODS) banks are the largest source of current ozone-depleting potential and warns that delaying capture and destruction of chlorinated fluorocarbon compound (CFC) bank leakage beyond 2011-2015 could reduce the possible ozone and climate benefits by about 30%. The report also includes policy options and recommendations. [Related item: *Call for Expanding Montreal Protocol on Ozone-Depleting Substances* in September 2007 environmental security report.]

**Military Implications:**

It is likely that the new Assessment will accelerate negotiations for a ban and implementation of regulations banning ozone-depleting chemicals. The military and its contractors should prepare to comply with new strictures and other chemicals’ phase-outs.

**Sources:**

The 2010 Assessment of the Scientific Assessment Panel

[http://ozone.unep.org/Assessment\\_Panels/SAP/Scientific\\_Assessment\\_2010/index.shtml](http://ozone.unep.org/Assessment_Panels/SAP/Scientific_Assessment_2010/index.shtml)

Ozone Secretariat Releases 2010 Scientific Assessment Report

<http://climate-l.iisd.org/news/ozone-secretariat-releases-2010-scientific-assessment-report/?referrer=climate-change-daily-feed>

**6.3. The Battle for Rare Earth Elements Continues**

The Chinese Ministry of Land and Resources again tightened control over the rare earth mineral supply by taking under central control 11 mining districts in the south of the country, applying a seldom-used mining law. It suggested that this is only a first step of a larger process that will place additional districts under the national government control. The move is justified

for addressing potential illegal strip-mining and refining of rare earths, and environmental degradation (including contamination of fields and waterways with powerful acids and other materials). Reportedly, export quotas for the first half of 2011 were cut by 35%, in addition to a 72% reduction in the second half of 2010. Tougher regulations, production quotas, and export restrictions, combined with rising international demand triggered rising prices (e.g. the price of neodymium—used in Toyota’s Prius hybrid car—rose to \$80 a kilogram from \$19 in 2009.)

A Japanese government-backed enterprise plans to deploy remote-controlled robots to mine rare earth elements up to a depth of 6,600 ft. from the seabed in proximity to the Izu and Ogasawara island chain and southwestern Okinawa islands. The project is targeting seabed volcanoes in search of minerals released from hydrothermal vents. Precious metals and methane hydrate, a potential next-generation fuel, are also a potential area of focus. [Related item:

*Chinese Rare Earth Restrictions* in September 2010 environmental security report.]

### **Military Implications:**

[Similar to previous on this issue] Accelerated R&D for substitutes should be encouraged. One can reasonably ask whether the Chinese actions are a market aggression test to determine how far they can press their rare earth mineral resource advantages.

### **Sources:**

China Seizes Rare Earth Mine Areas

<http://www.nytimes.com/2011/01/21/business/global/21rare.html>

Rare Earth Metals Leave Toxic Trail to Toyota, Vestas

<http://www.businessweek.com/news/2011-01-06/rare-earth-metals-leave-toxic-trail-to-toyota-vestas.html>

Japan deep-sea robots to seek minerals: report

<http://www.physorg.com/news/2011-01-japan-deep-sea-robots-minerals.html>

## **6.4 EU to Set Resource Efficiency Targets**

The European Commission is preparing a "roadmap" in the form of a set of resource efficiency targets to be published at mid-2011. It is expected that member states will be required to limit their consumption of fuels, minerals, and water, among other resources, potentially linked to the “European Semester” system for monitoring member state budgets. [Related item: *European Climate and Energy Package Formally Adopted* in April 2009 environmental security report.]

### **Military Implications:**

The military and its contractors stationed in the EU should be prepared to adapt, as legally appropriate, to the new regulations, as it is not clear at this point if there will be exemptions for the military.

### **Source:**

EU moots link between resource efficiency and budgetary targets

<http://euobserver.com/9/31704/?rk=1>

## **6.5 NATO Continues to Develop Cyber Defense Policies**

NATO nations’ Senior National Policy Advisors held a meeting in Brussels, January 25, 2011, assessing ways of using NATO assets and capabilities for further developing the Alliance’s cyber defense policy and common defense system against cyber threats. “There simply can be no true security without cyber security,” noted NATO Secretary General, Anders Fogh Rasmussen, highlighting that this meeting is an “important part of getting ahead of the cyber curve.” Cyber

security is also identified as an increasing challenge in NATO's New Strategic Concept. [Related items: *The EU Strengthens Legislation to Counter Cybercrime* in December 2010, and *NATO's New Strategic Concept Includes Environmental Security* in November 2010 environmental security reports.]

**Military Implications:**

Military personnel with cyber security expertise and their NATO counterparts should collaborate on creating global cybersecurity strategy, agreements, and enforcement measures.

**Source:**

Developing NATO's cyber defence policy

[http://www.nato.int/cps/en/natolive/news\\_70049.htm](http://www.nato.int/cps/en/natolive/news_70049.htm)

**6.6 India Urges Strengthening Outer Space Treaty**

The "Space, Science, and Security" conference held in New Delhi, January 19-21, 2011, addressed eventual updates to the Outer Space Treaty to better address security aspects. Keynote speaker Air Chief Marshal S. Krishnaswamy, India's former head of the Air Force, in addition to amendments to the Treaty, suggested establishing, "a strong policing force in the UN," to prevent militarization of space. He underlined that the new amendments should specifically outlaw installing nuclear and other weapons of mass destruction, as well as establishing military bases or conducting testing or military maneuvers in space or on celestial bodies. However, any research and use of equipment for peaceful purposes shall not be prohibited. The conference was organized by Observer Research Foundation, Secure World Foundation, and Stockholm International Peace Research Institute. [Related item: *Steps for an International Regime for Space Debris and Space Traffic Control System* in May 2009 environmental security report.]

**Military implications:**

[Same as previous on similar issues] In addition to the DOD's Commercial and Foreign Entities program, the military should increase cooperation with military counterparts and civilian organizations around the world to explore joint research programs and design of a legal framework to increase space security.

**Sources:**

Plug holes in UN 'Outer Space Treaty', says former Air Chief

<http://news.oneindia.in/2011/01/19/plugholes-in-un-outer-space-treaty-says-former-airchief-aid0121.html>

Space, Science, and Security: The Role of Regional Expert Discussions New Delhi, January 19-21

<http://swfound.org/events/2011/space,-science,-and-security-the-role-of-regional-expert-discussions>

**6.7 Climate Change****6.7.1 Scientific Evidence and Natural Disasters**

2010 was one of the two warmest years on record (tied with 2005), and the 34<sup>th</sup> consecutive year above the 20<sup>th</sup> century average, announced the World Meteorological Organization (WMO) based on data from the UK Meteorological Office Hadley Center, NOAA, and NASA. Exceptionally warmer regions included much of Africa and southern and western Asia, Greenland, and Arctic Canada, with some sub-regions registering temperatures 1.2 to 1.4°C (2.2 to 2.5°F) above the long-term average. The WMO also notes that 2001-2010 was the warmest decade on record, with the global average 0.46°C above the 1961-1990 average. WMO also

underlines the high number of extreme weather events in 2010, including severe floods in Pakistan, Sri Lanka, the Philippines, Brazil and Australia, as well as the heat wave in Russia.

2010 was also the deadliest year in at least two decades, according to the Centre for Research on the Epidemiology of Disasters. There were 373 disasters registered, which killed 296,800 people, affected 207 million, and caused damages estimated to \$109 billion. Some 89% of all those affected by disasters in 2010 lived in Asia. Similarly, according to Munich Re, 2010 natural catastrophes killed 295,000 people, costing approximately \$130 billion. By its standards, there were 950 natural disasters in 2010 (365 in the Americas, 310 in Asia, 120 in Europe, 90 in Africa and 65 in Australia and Oceania); 90% were weather-related. The other major reinsurer, Swiss Re, reported that man-made and natural disasters in 2010 caused worldwide economic losses of \$222 billion, more than three times more than in 2009.

*Mapping the impacts of natural hazards and technological accidents in Europe*, a report by the European Environment Agency, found that the number and impacts of disasters in Europe have increased over the period 1998-2009, causing nearly 100,000 fatalities and economic losses of about €150 billion (approx. \$200 billion). It warns that losses due to climate change are likely to increase in the future.

#### 6.7.2 Food and Water Security

The sixth edition of the Global Risk report by the World Economic Forum identifies the "water-food-energy" nexus as one of three key clusters of risks (the other two being macroeconomic imbalances and illegal economy). The UN Food and Agriculture Organization (FAO) announced that food prices hit a record high in December 2010. Its Food Price Index was 214.7, the highest since 1990 when it was created. In its report *Guide for Policy and Programmatic Action at Country Level to Address High Food Price*, FAO urges countries to refrain from export bans and other actions that could exacerbate the current food crisis. Speaking at the World Economic Forum in Davos, Susilo Bambang Yudhoyono, President of Indonesia, warned that the next economic war could be over scarce resources, if problems of rising food prices, poverty and population growth are not addressed and urged that food security must be a G20 priority.

#### 6.7.3 Melting glaciers and sea ice

The WMO reports that Arctic sea-ice cover in December 2010 was the lowest on record, with an average monthly extent of 12 million square kilometers, 1.35 million square kilometers below the 1979-2000 average for December. Greenland also experienced record surface melting and runoff in 2010, with the annual melting season up to 50 days longer than the average observed between 1979 and 2009, and with summer snowfall below average, notes an international group of researchers in a study published in the journal *Environmental Research Letters*, on January 21, 2011.

#### 6.7.4 Health

An *Animal Migration and Infectious Disease Risk* study published in *Science* magazine, warns about potential change of patterns of infectious diseases and their transmission from animals to humans due to climate change and environmental degradation, changes of migration patterns, and greater interaction between human and animal habitat.

### 6.7.5 Computer Modeling and Scenarios

A computer modeling of climate change to the year 3000 shows that even with zero CO<sub>2</sub> emissions beginning in 2100, climate change effects will continue for the next 1,000 years. Regional changes in temperature and precipitation would still be considerable, although the global mean temperature would likely remain the same. The West Antarctic Ice Sheet would collapse by 3000, raising global sea levels by approximately 4 meters. The model was produced by researchers at the Univ. of Victoria and Univ. of Calgary in Canada.

#### **Military and Security Implications:**

[Same as previous on this issue] The military should identify all its resources and programs for reducing greenhouse gases (GHGs) and responding to effects of climate change, update information continuously, forecast how it might be called upon for both mitigation and adaptation, and perform a gap analysis in anticipation of future requests. International discourse over climate change is increasing the development of international policies and strategies to mitigate and adapt to climate change.

**Sources:** (see an expanded list in the [Appendix](#))

It's Official: 2010 in a Statistical Tie for Warmest Year On Record

<http://www.climatecentral.org/news/its-official-2010-in-a-statistical-tie-for-warmest-year-on-record/>

2010 equals record for world's warmest year

[http://www.wmo.int/pages/mediacentre/press\\_releases/pr\\_906\\_en.html](http://www.wmo.int/pages/mediacentre/press_releases/pr_906_en.html)

Overall picture of natural catastrophes in 2010 – Very severe earthquakes and many severe weather events

[http://www.munichre.com/en/media\\_relations/press\\_releases/2011/2011\\_01\\_03\\_press\\_release.aspx](http://www.munichre.com/en/media_relations/press_releases/2011/2011_01_03_press_release.aspx)

Mapping the impacts of natural hazards and technological accidents in Europe'

<http://www.eea.europa.eu/publications/mapping-the-impacts-of-natural>

Global Risk 2011

<http://riskreport.weforum.org/>

Policy guide for countries hit hard by high food prices

<http://www.fao.org/news/story/en/item/49954/icode/>

Indonesia's President says food security must be G20 priority

<http://www.google.com/hostednews/afp/article/ALeqM5gmhg0nKzrqDTGK9ww6o9bUkohyGQ?docId=CNG.7cf561b86d25fb9fcfc035de4e9a829a.f1>

2010 equals record for world's warmest year

[http://www.wmo.int/pages/mediacentre/press\\_releases/pr\\_906\\_en.html](http://www.wmo.int/pages/mediacentre/press_releases/pr_906_en.html)

Greenland's ice feels the heat in record-setting 2010

<http://www.nytimes.com/cwire/2011/01/21/21climatewire-greenlands-ice-feels-the-heat-in-record-sett-93789.html>

Animal Migration and Infectious Disease Risk. Science 331, 6015: pp. 296-302

<http://www.sciencemag.org/content/331/6015/296.full?ijkey=uTHIpf2u3UUw&keytype=ref&siteid=sci>

Ongoing climate change following a complete cessation of carbon dioxide emissions

<http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo1047.html>

### 6.8 Nanotechnology Safety Issues

More detailed descriptions of the following nanotechnology issues are in the [Appendix](#)

- ISO published standard for inhalation toxicity testing of nanoparticles ([more](#))
- Phase 2 of the Environmental Nanoscience Initiative—UK and U.S. collaboration on three projects on EHS for Manufactured Nanomaterials ([more](#))

- Thailand nanotechnology safety and ethics strategy plan to be submitted to the government in 2011, with full regulation expected in five years ([more](#))
- Review of the long history of nanosilver usage and regulation, and implications ([more](#))
- Study shows TiO<sub>2</sub> nanoparticles disrupt aquatic ecosystems ([more](#))
- Nanotech Insight Conference is to be held in Cairo, 27 February – 2 March 2011 ([more](#))
- EU launches public consultation on risk assessment of nanomaterials in food ([more](#))

## **Item 7. Reports and Information Suggested for Review**

### **7.1 Comprehensive Assessment of Environmental Security**

*Environmental Security: A Guide to the Issues* by Elizabeth L. Chalecki is a comprehensive overview of environmental security issues and discourse. It addresses the security implications of shortages and abundance of natural resources, the international ramifications of food security, the social impacts of changes of the global ecosystem due to climate change, and the effects of war and preparation for war on the natural environment. The book also, "...explores how nations can, and must, cooperate with each other to confront and manage these threats."

#### **Military Implications:**

The book might provide some new insights into environmental problems and how environmental diplomacy could prevent conflict.

#### **Source:**

*Environmental Security. A Guide to the Issues*

<http://www.greenwood.com/books/printFlyer.aspx?sku=A3197C>

### **7.2 New Global Land Cover Maps**

A global land cover map was created by European Space Agency and the Belgian Université Catholique de Louvain using 12 months of 2009 data from Envisat's Medium Resolution Imaging Spectrometer at a resolution of 300 m. (<http://ionial.esrin.esa.int/>)

A pan-European land cover and use map for 2009 created by ESA's GlobCorine project is now available on-line. (<http://ionial.esrin.esa.int/globcorine/>)

The first regional atlas on the state of the environment in Latin America and the Caribbean, with more than 200 images illustrating the principal environmental issues of the region was prepared by UNEP in cooperation with others. ([http://www.cathalac.org/lac\\_atlas/](http://www.cathalac.org/lac_atlas/))

The new on-line National Atlas of the U.S. produced by the USGS has scores of layers covering a wide range of environmental topics. (<http://nationalatlas.gov/>)

#### **Military Implications:**

These maps could be useful in identifying future environmental hotspots and other issues of environmental security.

### **7.3 Evolution of Environmental Management Philosophy in China**

The paper *The Evolution of Environmental Management Philosophy Under Rapid Economic Development in China* published in *AMBIO: A Journal of the Human Environment*, seems to be

a comprehensive assessment of China's approach to environmental matters, mainly from an energy needs point of view.

**Military Implications:**

The paper should be reviewed for its insights into environmental management activities in the PRC in preparation for any environmental security cooperation between the US and China.

**Source:**

The Evolution of Environmental Management Philosophy Under Rapid Economic Development in China (only preview available; purchase or subscription required for full text)

<http://www.springerlink.com/content/72l5678t4l281v40/>



## APPENDIX

### Reference Details

This Appendix contains expanded background information on some items.

### Item 6. Updates on Previously Identified Issues

#### 6.7 Climate Change

**Sources:** (an expanded list)

##### 6.7.1 Scientific Evidence and Natural Disasters

It's Official: 2010 in a Statistical Tie for Warmest Year On Record

<http://www.climatecentral.org/news/its-official-2010-in-a-statistical-tie-for-warmest-year-on-record/>

2010 equals record for world's warmest year

[http://www.wmo.int/pages/mediacentre/press\\_releases/pr\\_906\\_en.html](http://www.wmo.int/pages/mediacentre/press_releases/pr_906_en.html)

Killer year caps deadly decade - reducing disaster impact is "critical" says top UN disaster official

<http://www.unisdr.org/news/v.php?id=17613>

Overall picture of natural catastrophes in 2010 – Very severe earthquakes and many severe weather events

[http://www.munichre.com/en/media\\_relations/press\\_releases/2011/2011\\_01\\_03\\_press\\_release.aspx](http://www.munichre.com/en/media_relations/press_releases/2011/2011_01_03_press_release.aspx)

Natural disasters 'killed 295,000 in 2010

<http://news.brisbanetimes.com.au/breaking-news-world/natural-disasters-killed-295000-in-2010-20110104-19e06.html>

Mapping the impacts of natural hazards and technological accidents in Europe'

<http://www.eea.europa.eu/publications/mapping-the-impacts-of-natural>

Disasters in Europe: more frequent and causing more damage

[http://www.eea.europa.eu/highlights/natural-hazards-and-technological-accidents?utm\\_source=EASubscriptions&utm\\_medium=RSSFeeds&utm\\_campaign=Generic](http://www.eea.europa.eu/highlights/natural-hazards-and-technological-accidents?utm_source=EASubscriptions&utm_medium=RSSFeeds&utm_campaign=Generic)

##### 6.7.2 Food and Water Security

Global Risk 2011

<http://riskreport.weforum.org/>

Extreme Weather Helps Drive Up Food Prices

<http://green.blogs.nytimes.com/2011/01/05/extreme-weather-sends-food-prices-soaring/?partner=rss&emc=rss>

Policy guide for countries hit hard by high food prices

<http://www.fao.org/news/story/en/item/49954/icode/>

Authoritarian governments start stockpiling food to fight public anger

<http://www.telegraph.co.uk/news/worldnews/middleeast/8288555/Authoritarian-governments-start-stockpiling-food-to-fight-public-anger.html>

Indonesia's President says food security must be G20 priority

<http://www.google.com/hostednews/afp/article/ALeqM5gmhg0nKzrqDTGK9ww6o9bUkohyGQ?docId=CNG.7cf561b86d25fb9fcfc035de4e9a829a.f1>

#### 6.7.3 Melting glaciers and sea ice

2010 equals record for world's warmest year

[http://www.wmo.int/pages/mediacentre/press\\_releases/pr\\_906\\_en.html](http://www.wmo.int/pages/mediacentre/press_releases/pr_906_en.html)

Greenland's ice feels the heat in record-setting 2010

<http://www.nytimes.com/cwire/2011/01/21/21climatewire-greenlands-ice-feels-the-heat-in-record-sett-93789.html>

#### 6.7.4 Health

Animal Migration and Infectious Disease Risk. Science 331, 6015: pp. 296-302

<http://www.sciencemag.org/content/331/6015/296.full?ijkey=uTHIpzF2u3UUw&keytype=ref&siteid=sci>

Changes in wildlife migration could alter disease risk

<http://www.scidev.net/en/agriculture-and-environment/news/changes-in-wildlife-migration-could-alter-disease-risk.html>

#### 6.7.5 Computer Modeling and Scenarios

Climate change to Continue to Year 3000 in Best Case Scenarios, Research Predicts

<http://www.sciencedaily.com/releases/2011/01/110109184025.htm>

Ongoing climate change following a complete cessation of carbon dioxide emissions

<http://www.nature.com/ngeo/journal/vaop/ncurrent/full/ngeo1047.html>

### **6.8 Nanotechnology Safety Issues**

More detailed descriptions of the nanotechnology issues

#### 6.8.1 ISO Published Standard for Inhalation Toxicity Testing of Nanoparticles

The International Organization for Standards (ISO) has published an International Standard to support the inhalation toxicity testing of nanoparticles: *ISO 10808:2010, Nanotechnologies – Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing*. An ISO official states, “In order to test inhalation toxicity it is necessary to monitor concentration, size and size-distribution of nanoscale particles in an inhalation chamber.

Traditional methods used in other areas are considered insufficient for testing nanoparticles since parameters specific to them like particle surface area or number, might be crucial determinants of toxicity.”

#### **Military Implications:**

This standard should be used in the planning and operation of systems for nanotech risk assessment and use.

#### **Sources:**

How toxic are nanoparticles? New ISO standard helps find out

<http://www.nanowerk.com/news/newsid=19862.php>

ISO 10808:2010 Nanotechnologies -- Characterization of nanoparticles in inhalation exposure chambers for inhalation toxicity testing

[http://www.iso.org/iso/catalogue\\_detail?csnumber=46130](http://www.iso.org/iso/catalogue_detail?csnumber=46130)

#### 6.8.2 Transatlantic Partners to Analyze Environmental Safety and Health (EHS) for Manufactured Nanomaterials

According to *Nanowerk News*, in Phase 2 of the Environmental Nanoscience Initiative, scientists from the UK and the US will collaborate on three major research projects:

- a risk assessment for manufactured nanoparticles used in consumer products;
- an investigation of how nanomaterials are transported into sewage treatment systems, soil and surface waters and sediments, and a range of organisms;
- an examination of the rate and behavior of nanomaterials carried into agricultural soil and absorbed into its biota, as well as new knowledge from a unique pilot-scale waste water treatment facility."

#### **Military Implications:**

Components concerned with nanotech EHS should establish liaison with the institutions involved with this effort, to follow the results obtained.

#### **Sources:**

Transatlantic partners to analyse environment and health risks of manufactured nanomaterials

<http://www.nanowerk.com/news/newsid=19871.php>

#### 6.8.3 Thailand Moves Toward Nanotechnology Safety and Ethics Strategy Plan

According to *Nanowerk News*, the Thai National Nanotechnology Center, NANOTEC, and the Nanotechnology Assoc. of Thailand are working on the country's first strategy plan on nanotech safety and ethics, to be submitted to the government in 2011, with full regulation expected in five years.

#### **Military Implications:**

Appropriate EHS personnel in the region should offer the benefit of their experience to assist the authorities in this work and also become prepared for its eventual regulatory results.

#### **Source:**

Thailand pushing forward on nanosafety regulations

<http://www.nanowerk.com/news/newsid=19736.php>

#### 6.8.4 Review of the Long History of Nanosilver Usage and Regulation, and Implications

A recent paper, *120 Years of Nanosilver History: Implications for Policy Makers*, points out that nanosilver in the form of colloidal silver has been used for more than a century and has been registered as a biocidal material in the U.S. since 1954, and states, "it would be a mistake for regulators to ignore the accumulated knowledge of our scientific and regulatory heritage in a bid to declare nanosilver materials as new chemicals, with unknown properties and automatically harmful simply on the basis of a change in nomenclature to the term 'nano.'"

#### **Military Implications:**

This point should be taken into account in considering regulatory actions on nanosilver, and reactions thereto.

**Source:**

Environmental Science & Technology Article Reviews History of Nanosilver and Policy Implications

<http://nanotech.lawbc.com/2011/01/articles/united-states/federal/environmental-science-technology-article-reviews-history-of-nanosilver-and-policy-implications/>

**6.8.5 Study Shows TiO<sub>2</sub> Nanoparticles Disrupt Aquatic Ecosystems**

A paper by environmental engineers April Gu and Carla Cherchi of Northeastern University in Boston reports that titanium dioxide nanoparticles, at the levels found in wastewater, "...could disrupt an aquatic ecosystem's carbon and nitrogen cycles", after experiments using a blue-green alga, *Anabaena variabilis*.

**Military Implications:**

These results should be taken into account in environmental risk assessments of the very wide range of products using TiO<sub>2</sub> nanoparticles. A review of the paper also points out that this toxicity, "...could have a potential application: Water purification processes based on nTiO<sub>2</sub> could limit growth of cyanobacteria in closed water systems, such as cooling towers and boilers."

**Sources:**

TiO<sub>2</sub> Nanoparticles in the Environment

<http://sites.merid.org/nanodev/more.php?articleID=2909>

TiO<sub>2</sub> Nanoparticles in the Environment (study)

<http://pubs.acs.org/cen/news/88/i40/8840news5.html>

**6.8.6 Nanotech Insight Conference to Be Held in Cairo, 27 February – 2 March**

The Nanotech Insight Conference is to be held in Cairo, 27 February – 2 March 2011. One of the listed topics is Nano Ethics / Environmental Impact. According to the announcement, the conference aims, "...to integrate the scientific and ethical aspects of nanoscience and technology where lasting relationships between scientists, technologists and legislators in the developed and developing areas of the planet may be formed."

**Military Implications:**

No further information on the program appears on the meeting's Web site. If details become available, EHS personnel in the area and concerned with nanotechnology should review them and consider attending.

**Source:**

Nanotech Insight Conference

<http://www.nanoinsight.sabrycorp.com/conf/nanoinsight/11/index.cfm>

**6.8.7 EU Launches Public Consultation on Risk Assessment of Nanomaterials in Food**

According to *Nanowerk News*, "...the European Food Safety Authority (EFSA) has launched a public consultation on its draft guidance document for engineered nanomaterial (ENM) applications in food and feed ... [that] sets out for applicants, the data needed to understand the specific properties of the ENM, allowing a risk assessment to be carried out."

**Military Implications:**

Because of the probable influence of this document on the future course of ENM regulation in the EU, appropriate nanotech risk assessment personnel should review it and, if warranted, submit comments on it by the deadline of 25 February 2011.

**Source:**

European Food Safety Authority launches public consultation on risk assessment of nanomaterials in food and feed

<http://nanotech.lawbc.com/2011/01/articles/international/efsa-begins-public-consultation-on-draft-guidance-on-risk-assessment-for-nanoscience-and-nanotechnologies/>